MDCA Overview

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MDCA Overview

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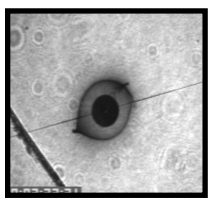
MDCA Science Elements

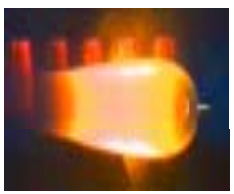
MDCA is a multi-user apparatus is being designed to accommodate a minimum of four combustion experiments. The current candidates are:

DCE-2 (F. Williams, UC @ San Diego & F. Dryer, Princeton): To better understand combustion kinetics of droplet burning history (transient & quasi-steady), radiative heat loss, and extinction phenomena. (Pace NRA)

BCDCE (B. Shaw, Univ. of CA, Davis): To study bi-component fuel droplets where spherical symmetry is approached in the gas and liquid phases to understand transient behaviors between the liquid & gas interfaces. (95 NRA)



SEDC (M.Y. Choi, Univ. of Ill @ Chicago): To better understand the effects of sooting and radiation influences on the overall burning behavior of droplets by means of optical and intrusive techniques. (97 NRA)



DDCE (V. Nayagam, NCMR): To investigate the effects of small convective flows on burning droplets and better define the influences of such flows on the extinction process. (97 NRA)

MDCA Program Status

- MDCA will conduct PDR on March 27-28, 2001
- MDCA preliminary design has been review by NASA Crew Office
- MDCA will utilize the FCF CIR as its platform for science operations
- The combination of MDCA, CIR and ISS resources and capabilities will provide the means for meeting the science requirements of DCE-2, BCDCE, SEDC and DDCE
- MDCA and CIR are in parallel development and work closely together to insure final designs will support all MDCA science requirements

FCF CIR/MDCA Integrated Systems Concept

PI Specific Hardware

- Unique PI fuels
- Specialty diagnostics
- Unique hardware components

Chamber Insert Assembly

- Platform for droplet:
  - Dispensing
  - deploying
  - Ignition
- Unique science requirements

Combustion Integrated Rack

- Power
- Common Diagnostics/ Illumination
- Environmental Control
- Data Processing/Distribution
- Fluids Control/Distribution
- Combustion Containment

MDCA Core Elements

The Chamber Insert Assembly (CIA)

- Provides the platform for:
  - Dispensing, deploying, tethering and igniting fuel droplets
  - Unique pieces of hardware required to meet specific PI science requirements (e.g. soot sampling, flow field generation, etc.)
  - MDCA provided diagnostics
  - Additional avionics components

The PI Avionics Box

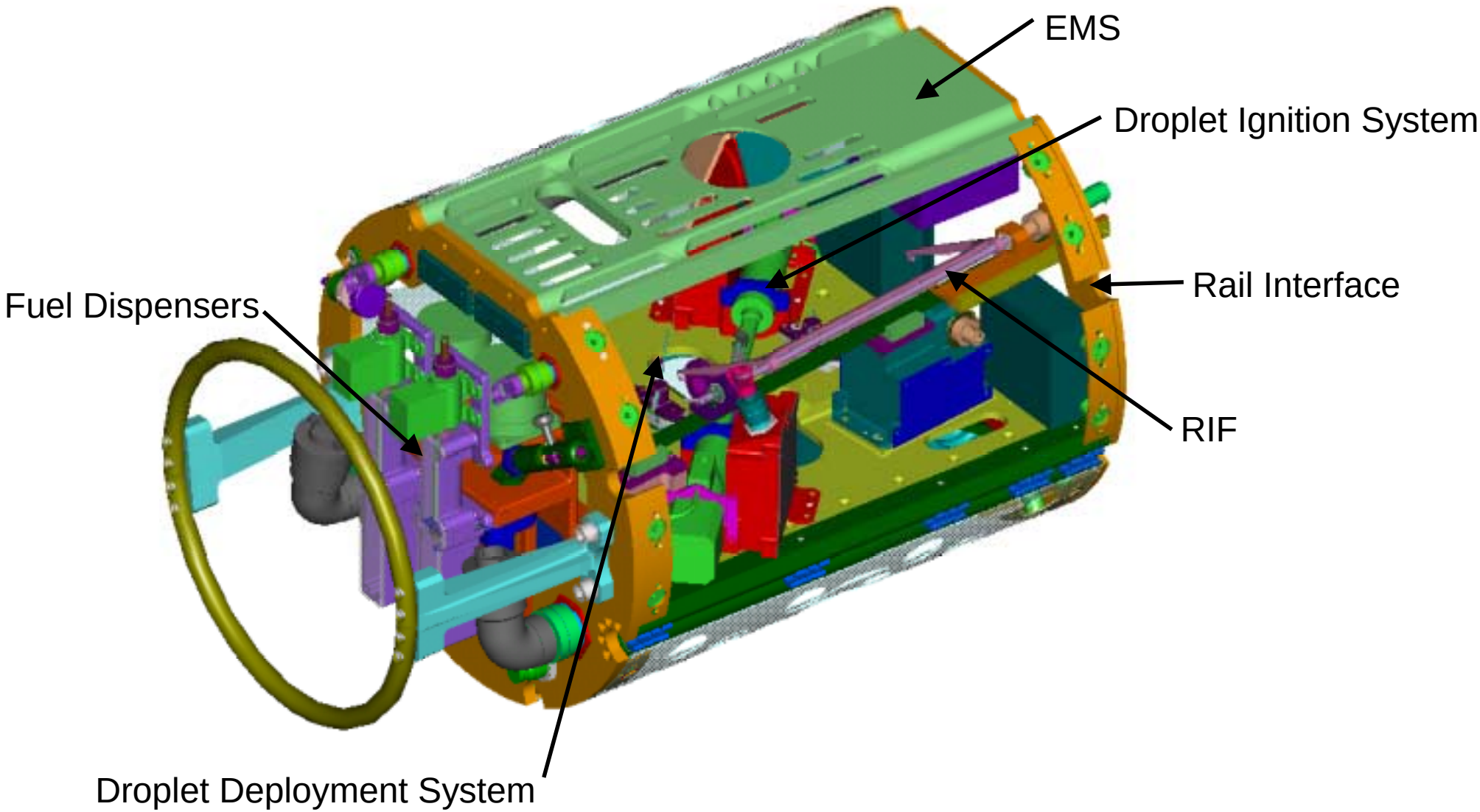
- Provides:
  - Power control and distribution for CIA and provides CDMS capabilities

MDCA Core Elements – Continued

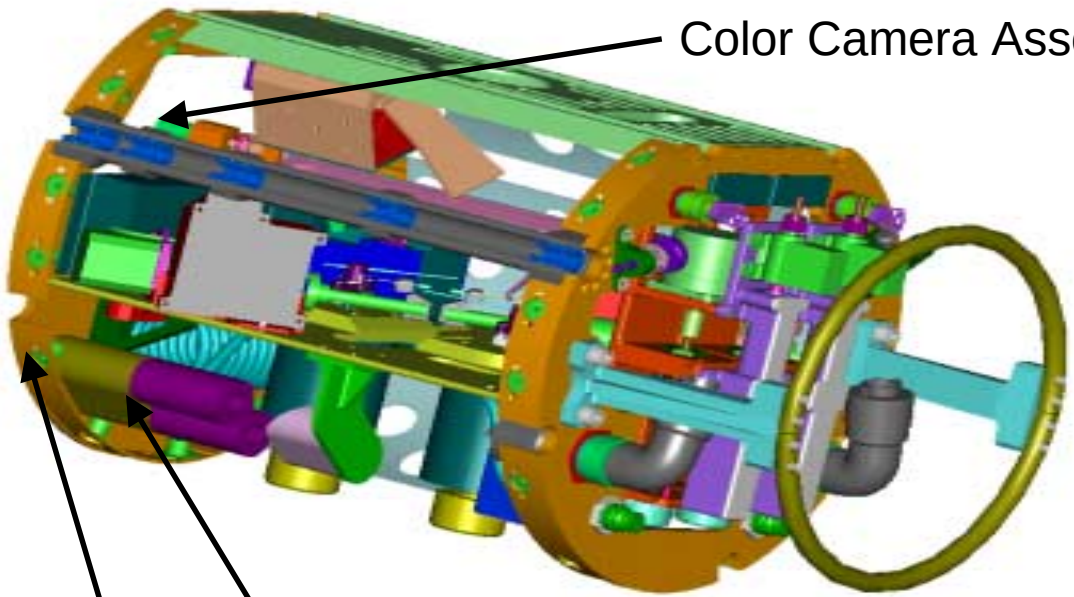
Chamber Insert Assembly (CIA) Hardware:

- Experiment Mounting Structure (EMS)
- Droplet Deployment System
- Dual Fuel Dispenser System
- Droplet Ignition System
- Radiometer Assembly
- Retractable Indexing Fiber (RIF) Assembly
- Color Camera Assembly
- Water Cooling System
- Rail Interface/Brake System

Chamber Insert Assembly



Chamber Insert Assembly – Continued



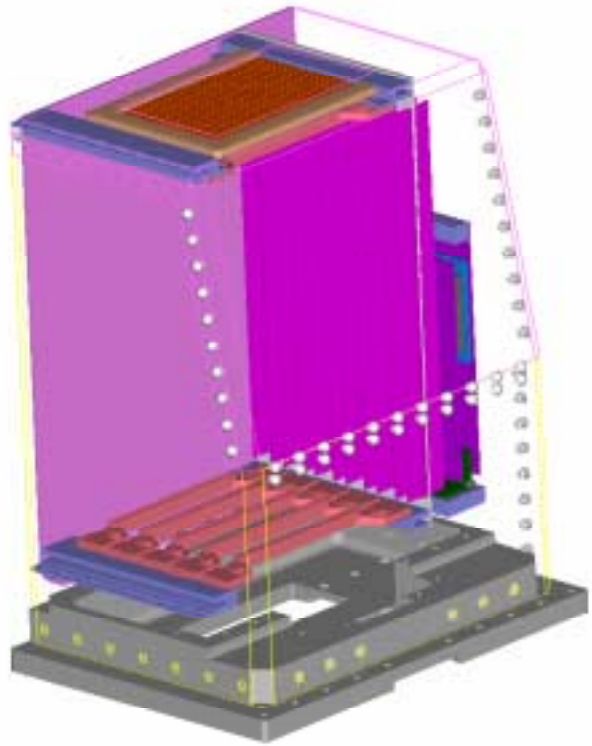
MDCA Core Elements

MDCA PI Avionics Box Hardware:

- Avionics Package (6U Compact PCI)
  - Processor Boards
  - Motor Control Boards
  - Industry Pack Carrier Boards (I/O)

Chamber Insert Mounted Avionics:

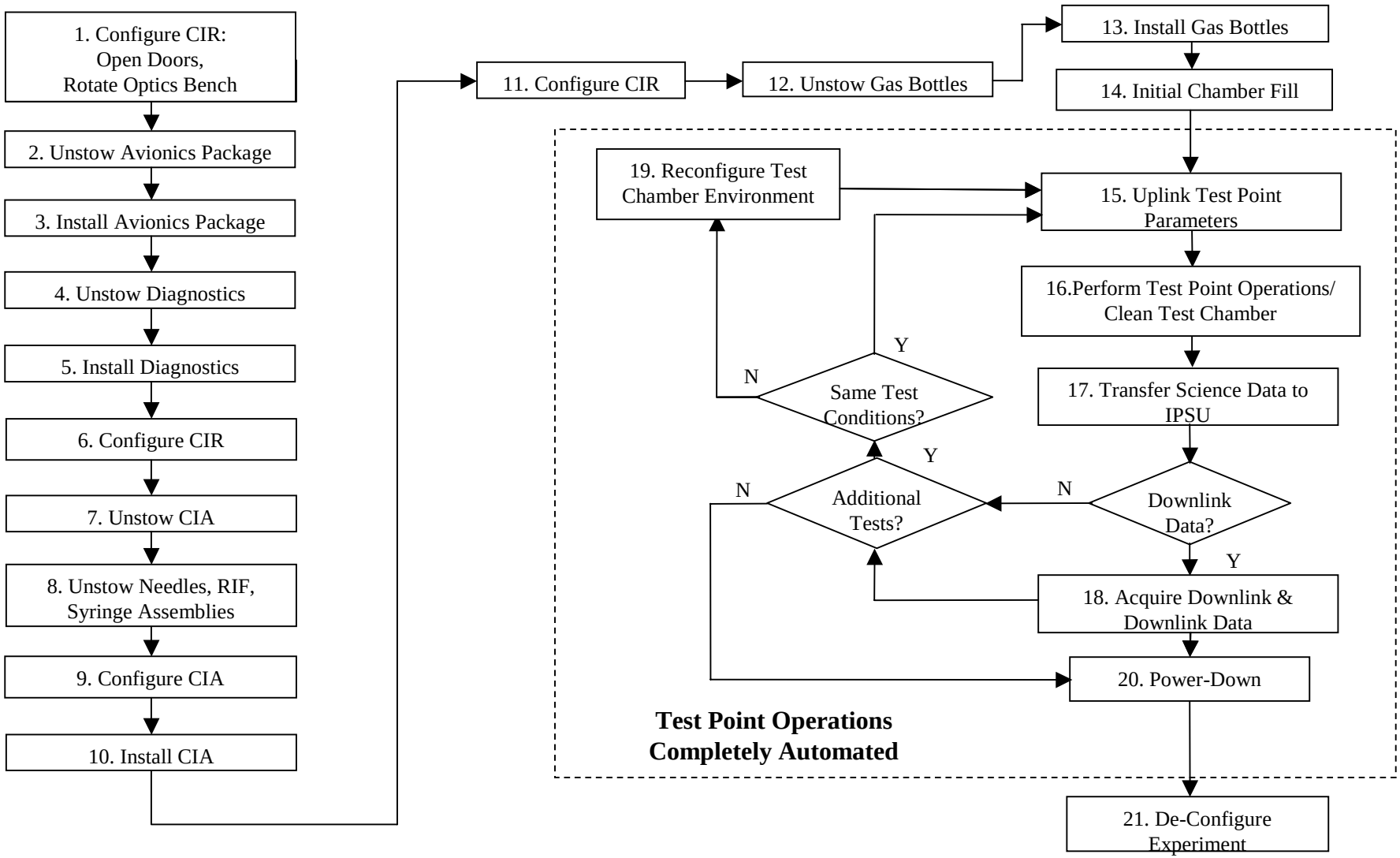
- Motor Drivers
- Health Monitoring Sensors



MDCA Operations Concept

- MDCA will be flown to the ISS on-board the MPLM.
- Upon deployment to ISS, MDCA will be configure for DCE-2, installed into the CIR and operated.
- Upon successful completion of DCE-2 science operations, the MDCA CIA will be removed from CIR, reconfigured for BCDCE, reinstalled into CIR and operated.
  - The same operations will follow for SEDC and DDCE.
- MDCA will be operated and controlled primarily from the ground with the provision for on-board control.
- Crew support will be focused on MDCA reconfiguration and the change out of consumables.

MDCA Operations Concept – Continued



Summary

- The MDCA design is on track to support the requirements of all four PIs while meeting its Flight Hardware Availability (FHA) date.
- MDCA and CIR plan integrated testing at both the Engineer and Flight model levels.
- MDCA and CIR have integration processes in place to insure bi-directional requirements flow and consistent design development.
- MDCA will “turn over” to CIR at the conclusion of integrated Flight Model testing.